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$$\begin{aligned}\therefore a^2 + b^2 + c^2 + d^2 + e^2 + f^2 &= 4[e^2 + f^2 + d^2]; \\ \therefore a^2 + b^2 + c^2 &= 3[e^2 + f^2 + d^2].\end{aligned}$$

$$\begin{aligned}\text{Since } e^2 + f^2 + d^2 \text{ (by construction)} &= \frac{AC^2}{4} + \frac{CB^2}{4} + \frac{AB^2}{4} \\ \therefore a^2 + b^2 + c^2 &= 3[AC^2 + CB^2 + AB^2].\end{aligned}$$

Also solved by G. B. M. Zerr, J. Scheffer, and the Proposer.

### CALCULUS.

255. Proposed by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

Find the general values of  $u$  and  $v$  in terms of  $x$ , which satisfy the equations  $u^2 + l^2 (du/dx)^2 = v^2$ ,  $u^2 + m^2 (du/dx)^2 = v^2 + n^2 (dv/dx)^2$ .

Solution by A. F. CARPENTER, Professor of Mathematics, Hastings, Neb.; GEORGE W. HARTWELL, Columbia University, and the PROPOSER.

Subtracting the first equation from the second, we get

$$[m^2 - l^2]/n^2 [du/dx]^2 = [dv/dx]^2.$$

$$\therefore v = \left( \frac{m^2 - l^2}{n^2} \right)^{\frac{1}{2}} u + C \dots (1).$$

$$\therefore u^2 + l^2 [du/dx]^2 = \frac{m^2 - l^2}{n^2} u^2 + 2u C \left( \frac{m^2 - l^2}{n^2} \right)^{\frac{1}{2}} + C^2.$$

$$\text{Let } [m^2 - l^2 - n^2]/n^2 = a, \text{ and } C \left( \frac{m^2 - l^2}{n^2} \right)^{\frac{1}{2}} = b.$$

$$\text{Then } l^2 [du/dx]^2 = au^2 + 2bu + C^2.$$

$$\therefore x = l \int \frac{du}{\sqrt{au^2 + 2bu + C^2}} = \frac{l}{2C} \log \left( \frac{au + b - C}{au + b + C} \right) + \log C_1.$$

$$\therefore x = \frac{l}{2C} \log \left( \frac{C_1 [au + b - C]}{au + b + C} \right). \quad \text{Let } e^{2Cx/l} = c.$$

$$\text{Then } c/C_1 = \frac{au + b - C}{au + b + C}, \text{ or } u = \frac{[b + C]c - [b - C]C_1}{a[C_1 - c]}.$$

$$\begin{aligned}\therefore u &= \frac{\{C[(m^2 - l^2)^{\frac{1}{2}} + n]/n\} e^{2Cx/l} - C_1 C[(m^2 - l^2)^{\frac{1}{2}} - n]/n}{[m^2 - l^2 - n^2][C_1 - e^{2Cx/l}]/n^2} \\ &= \frac{Cn\{[(m^2 - l^2)^{\frac{1}{2}} + n]e^{2Cx/l} - C_1[(m^2 - l^2)^{\frac{1}{2}} - n]\}}{[m^2 - l^2 - n^2][C_1 - e^{2Cx/l}]}.\end{aligned}$$

$v$  is found at once from (1).

Also solved by V. M. Spunar, J. Scheffer, A. H. Holmes, and J. I. Wodo.